

Application Serial
No. 09/634,507

REMARKS

Section 2 of the Office Action - In section 2 of the Office Action, the Examiner rejected claims 20, 21, and 23 under 35 U.S.C. §102 as being anticipated by the Cook patent.

The Cook patent discloses a sensor die 10 and a buffer member 12. An electronic circuit 18 and three conductive pads 20, 22 and 24 are provided on a first surface 14 of the sensor die 10. A cavity 44 is etched in a second surface 16 of the sensor die 10 to form a diaphragm 50. An opening 36 is formed through the buffer member 12, and a channel 40 is formed in a surface 30 of the buffer member 12 and is disposed in fluid communication with the opening 36. A fluid conduit 60 is attached to the buffer member 12 so that fluid communication is established between the fluid conduit 60, the opening 36, the channel 40, and the cavity 44. Pressure sensing components 51 are formed on the diaphragm 50.

As shown in Figure 7 of the Cook patent, the buffer member 12 is disposed above the sensor die 10, a first housing member 80 has the fluid conduit 60 extending therethrough, and a second housing member 84 is shaped to mate with the first housing member 80 such that

Application Serial
No. 09/634,507

the sensor die 10 and the buffer member 12 are housed therebetween. The fluid conduit 60 is in fluid communication with the opening 36 of the buffer member 12. A seal 90 is provided between the buffer member 12 and the first housing member 80 around the fluid conduit 60. In order to provide electrical communication between the contact pads 20, 22 and 24 and external devices, a plurality of electrically conductive leads 94 extend through the second housing member 84. An elastomeric conductor 98 is disposed in contact with the contact pads 20, 22 and 24 and the electrically conductive leads 94. A second fluid conduit 100 is provided through the housing member 84 in order to permit the pressure sensor to measure differential pressures.

Independent claim 20 is directed to a method of determining flow rate through a flow conductor in which a pressure change is created within a housing having only two separate housing portions, the pressure change is sensed using a sensing element mounted within the housing, the sensing element is sealed within the housing using a seal, and an electrical signal is communicated from the sensing element to an exterior of the housing.

Applicant's Argument - The Cook patent does not disclose the step of creating a pressure change within a

Application Serial
No. 09/634,507

housing having only two separate housing portions. More specifically, while the arrangement shown in Figure 7 can be used to sense a pressure differential, and while this pressure differential may exist within the housing comprising the housing members 80 and 84, there is no disclosure in the Cook patent that the pressure differential is created within this housing members 80 and 84.

Indeed, as far as the disclosure of the Cook patent is concerned, the pressure differential is created outside of the housing. For example, there is no disclosure of a restriction within the Cook housing that would create a pressure differential.

The Examiner asserts that the Cook patent at column 7, lines 18-28 teaches creating a pressure differential within the housing. However, the Cook patent merely discloses that the pressure sensor can be used to measure differential pressures. This portion of the Cook patent does not disclose that the pressure differential is created within the housing.

Accordingly, because the Cook patent does not disclose creating a pressure differential within the housing, the Cook patent does not anticipate independent claim 20.

Application Serial
No. 09/634,507

Moreover, there is no disclosure in the Cook patent of determining a flow rate.

Accordingly, for this reason also, the Cook patent does not anticipate independent claim 20.

Further, independent claim 20 is not obvious over the Cook patent because the Cook patent does not suggest creating the pressure differential within the housing.

Because independent claim 20 is patentable over the Cook patent, dependent claims 21 and 23 are likewise patentable over the Cook patent.

Examiner's Response - The Examiner did not respond to applicant's argument that the Cook patent fails to disclosed the creation of a pressure differential within the two part housing.

The Examiner responded to applicant's other argument that the Cook patent fails to disclose flow rate determination by asserting that (i) the flow rate determining language is in the preamble of independent claim 20 and, therefore, need not be given any patentable weight, and (ii) the determination of flow rate does not appear in independent claim 20 and applicant has merely read this limitation into independent claim 20 from the specification.

Application Serial
No. 09/634,507

Applicant's Rebuttal - Although the Examiner did not rebut applicant's argument that the Cook patent fails to disclose the step of creating a pressure change within a housing having only two separate housing portions, applicant will amplify this argument.

The Cook patent does not show that the differential pressure is created within the housing 80/84. Instead, the Cook patent shows that the conduits 60 and 100 communicate a differential pressure from outside of the housing 80/84 to the diaphragm 50 on which the pressure sensing components 51 reside. Thus, it should be clear that the differential pressure to be sensed is created outside of the housing 80/84.

Moreover, the Cook patent discloses no elements that could create a differential pressure within the housing 80/84. For example, the Cook patent discloses no flow restriction that creates a pressure differential or change. Moreover, the diaphragm 50 does not create the differential pressure that is being sensed. It merely senses the pressure difference.

Accordingly, the Cook patent does not disclose one of the limitations of independent claim 20.

For this reason, the Cook patent does not anticipate independent claim 20.

Application Serial
No. 09/634,507

As noted above, the Examiner did response to applicant's argument that the pressure sensor disclosed in the Cook patent is not a flow rate sensor by asserting that the flow rate limitation is in the preamble of independent claim 20. Therefore, according to the Examiner, the Examiner need not give the flow rate language any weight.

However, the flow rate language in independent claim 20 should be given weight because other language in independent claim 20 supports the flow rate language. For example, independent claim 20 recites the step of creating a pressure change within a housing having only two separate housing portions. The purpose of creating this pressure change is to sense flow rate.

Accordingly, the flow rate language of independent claim 20 cannot be ignored.

Consequently, the Cook patent does not disclose another of the limitations of independent claim 20.

For this reason also, the Cook patent does not anticipate independent claim 20.

Section 4 of the Office Action - In section 4 of the Office Action, the Examiner rejected claims 1, 2, 6-9, 11, 12, 15-17, 19, and 25-28 under 35 U.S.C. §103 as

Application Serial
No. 09/634,507

being unpatentable over the Frick patent in view of the Cook patent.

The Frick patent discloses a pressure transmitter 10 having four major (and separate) components - an input/output unit 12, a pressure transducer 14, a flange 16, and an orifice 28/30. The input/output unit 12 is connected to the pressure transducer 14 by a neck 18, the flange 16 is connected by pipes 24 and 26 to the orifice 28/30, and the flange 16 is mounted to the pressure transducer 14 by bolts 27.

The pipe 24 is connected to one side of the orifice 28/30, and the pipe 26 is connected to the other side of the orifice 28/30. The orifice 28/30 provides a pressure drop as a function of flow through a conduit 32. The pipe 24 is connected to a passageway 36 in the flange 16, and the pipe 26 is connected to a passageway 38 in the flange 16.

The passageways 36 and 38 couple the pipes 24 and 26 to fluid chambers 40 and 42 of the flange 16. The fluid chambers 40 and 42 cooperate with first and second pressure transmitting means formed in the pressure transducer 14 when the flange 16 and the pressure transducer 14 are mated together. The first and second pressure transmitting means comprise isolation diaphragms

Application Serial
No. 09/634,507

50 and 52 disposed between the pressure transducer 14 and the flange 16. Seals 58, such as O-ring seals, are interposed between the pressure transducer 14 and the flange 16 and are annular to rims 54 and 54a of the isolation diaphragms 50 and 52 in order to seal the fluid chambers 40 and 42.

Fluid cavities 61 and 63 are formed in the transducer 14 such that the isolation diaphragm 50 isolates the fluid chamber 40 from the fluid cavity 61 and such that the isolation diaphragm 52 isolates the fluid chamber 42 from the fluid cavity 63. Fluid conduits 62 and 64 couple the fluid cavities 61 and 63 to a sensor element 66 of the input/output unit 12. The fluid conduits 62 and 64 are filled with a substantially incompressible fluid 65. A measuring diaphragm 72 of the sensor element 66 separates chambers 68 and 70.

Accordingly, a differential pressure is developed by the orifice 28/30 and is conveyed by the pipes 24 and 26 through the passageways 36 and 38 to the chambers 40 and 48 where the differential pressure acts on the isolation diaphragms 50 and 52. This differential pressure deflects the isolation diaphragms 50 and 52 to create a differential pressure in the fluid cavities 61 and 63, and this differential pressure is transmitted

Application Serial
No. 09/634,507

through the incompressible fluid 65 in the fluid conduits 62 and 64 to the chambers 68 and 70 of the sensor element 66.

The sensor element 66 is externally excited by the input/output unit 12 via electrical leads 74. In response to the differential pressure in the chambers 68 and 70, the measuring diaphragm 72 deflects to vary the capacitance of the sensor element 66, which alters the external exciting signal. This change in the exciting signal is representative of the differential pressure and is transmitted through the electrical leads 74 and through the input/output unit 12 to external leads 15.

Alternatively, the Frick patent discloses that the sensor element 66 may be located near the isolation diaphragms 50 and 52 and may be supported in the transducer 14 instead of in the input/output unit 12. The Frick patent also discloses that the first and second pressure transmitting means may directly sense fluid pressure such as when they comprise strain gauges. However, the Frick patent does not disclose how the pressure transducer 14 is to be modified to accommodate such alternatives.

The Frick patent further discloses that a calibration manifold 17 may be used instead of the flange

Application Serial
No. 09/634,507

16 between the pipes 24, 26 and the pressure transducer 14. The calibration manifold 17 includes three valves 84, 86, and 88 that may be use to permit calibration of the pressure transmitter 10.

Independent claim 1 is directed to a flow sensor package comprising a housing, a sensing element, a restriction, and a seal. The housing has an inlet, an outlet, and first and second channels in communication with the inlet and the outlet. The sensing element is in the first channel, and the restriction is in the second channel. The seal engages the sensing element so as to prevent flow of a fluid past the sensing element, the seal has an electrically conductive path from the sensing element to a lead, and the lead is outside of the housing.

At the outset, it is noted that the Examiner has misapplied the Frick patent to independent claim 1. The Examiner maintains that the element 88 as disclosed in the Frick patent is a restriction that creates a differential pressure. However, the element 88 is described as a valve and its function, according to the Frick patent, is to (i) selectively enable fluid pressure exchange between the first and second fluid passageways 36A and 38A to permit the pressure transmitter 10 to be

Application Serial
No. 09/634,507

calibrated, and (ii) selectively disable fluid pressure exchange between the first and second fluid passageways 36A and 38A to permit the pressure transmitter 10 to sense differential pressures.

In other words, the valve 88 is either open or closed. When the valve 88 is open, the pressure in the passageways 36 and 38 equalize so that there is no pressure differential applied to the sensor element 66 and the pressure transmitter can be calibrated. On the other hand, when the valve 88 is closed, the differential pressure created by the orifice 28/30 is allowed to act differentially on the isolation diaphragms 50 and 52, and the output of the sensor element 66 reflects this differential pressure.

Therefore, as can be seen from the above, the valve 88 is not a restriction.

Moreover, the Examiner recognizes that the Frick patent fails to teach the invention of independent claim 1 in a number of respects. Therefore, the Examiner relies on the Cook patent. However, the Examiner is rather vague about how the pressure sensor disclosed in the Frick patent should be modified in view of the Cook patent to meet the limitations of independent claim 1.

Application Serial
No. 09/634,507

For example, as the Examiner recognizes, the sensor element 66 is not in the first channel 36A (or in the second channel 38A), as the Examiner interprets the Frick patent vis-à-vis independent claim 1. Moving the sensing element 66 to the first channel 36A (or the second channel 38A) does not make sense because there is no differential pressure in either of these channels. The differential pressure exists only across these channels 36A and 38A.

The Examiner appears to assert, however, that it would have been obvious in view of the Cook patent to move the sensor element 66 directly across the first channel 36A and the second channel 38A in order to make the sensor small and compact. Yet, such a modification is directly contrary to the teaching of the Frick patent, which instead discloses a need to isolate the sensor element 66 from the first and second channels 36A and 38A. Therefore, the Frick patent teaches away from moving the sensor element 66 directly across the first channel 36A and the second channel 38A. Moreover, there is no suggestion in the prior art that the pressure transmitter 10 need be smaller and more compact than it already is.

Application Serial
No. 09/634,507

The Examiner further recognizes that the Frick patent fails to disclose a conductive seal that engages the sensor element 66 and that conducts signals from the sensor element 66 to outside of the housing. The Frick patent does disclose a pair of seals 58. However, these seals do not engage sensor element 66 and they are not disclosed in the Frick patent as being conductive.

In order to combine a conductive seal with the pressure transmitter 10 disclosed in the Frick patent, the Examiner appears to assert that it would have been obvious in view of the Cook patent to seal the sensor element 66 with the conductive seal 98 disclosed in the Cook patent. However, the sensor element 66 disclosed in the Frick patent is a capacitive type sensor, and the Examiner has not suggested how such a capacitive sensor element can be sealed by the seal 98 disclosed in the Cook patent without interfering with the operation of the sensor element 66. That is, the Examiner has not suggested why electrical contact between the capacitive type sensor element 66 disclosed in the Frick patent and the conductive seal 98 disclosed in the Cook patent would not impair the operation of the sensor element 66.

Application Serial
No. 09/634,507

Accordingly, the Examiner has not carried the burden of establishing a prima facie case of obvious with respect to independent claim 1.

Therefore, because the Frick patent fails to teach a restriction in the first channel 36A (or, for that matter, in the second channel 38A), because the Frick patent teaches away from moving the sensor element 66 to a position where it is directly between the first and second channels 36A and 38A, and because the Examiner has not carried the burden of establishing a prima facie case of obvious with respect to sealing the sensor element 66 by way of a conductive seal, independent claim 1 would not have been obvious over the Frick patent in view of the Cook patent.

Examiner's Response - The Examiner did not respond to applicant's arguments that the Frick patent teaches away from moving the sensor element 66 to a position where it is directly between the first and second channels 36A and 38A, and that the Examiner has not carried the burden of establishing a prima facie case of obvious with respect to sealing the sensor element 66 by way of a conductive seal. The Examiner did respond to applicant's argument regarding the valve 88.

Application Serial
No. 09/634,507

Applicant's Rebuttal - As to the Examiner's response to applicant's argument regarding the valve 88 disclosed in the Frick patent, applicant is not quite sure of the Examiner's point. Independent claim 1 requires a restriction whereas the Frick patent shows a valve (i.e., the valve 88). A valve is not a restriction and a restriction is not a valve.

Moreover, the Frick patent describes the valve as an on/off valve. That is, as disclosed in column 7, lines 53-58 of the Frick patent, the valve 88 selectively enables fluid pressure exchange between first and second fluid passageways 36A and 38A and fluidly isolating such passageways from each other. This operation allows the sensor disclosed in the Frick patent to be calibrated. That is, as further disclosed in column 7, line 59 through column 8, line 21, during calibration, the valve 88 is opened to transmit the pressure of the fluid in fluid passageway 36A to the fluid passageway 38A thereby equalizing the fluid pressure in both first and second fluid chambers 40 and 42. To accomplish this operation, the valve must be fully opened.

After calibration and during normal operating conditions when differential pressure transmitter 10 is measuring differential pressure, the valve 88 is closed

Application Serial
No. 09/634,507

so that the first and second fluid passageways 36A and 38A are fluidly isolated from each other.

As can be seen, the Frick patent does not suggest that the valve 88 is a restriction and further does not suggest that the valve 88 be replaced by a restriction.

Accordingly, the valve 88 does not meet the claimed limitation of a restriction.

Furthermore, as discussed above, the passage from the Frick patent cited by the Examiner shows that the valve 88 is not a restriction. The valve 88 either allows equal pressure between the passages 36A and 38A to be equal (which is not the function of a restriction) or isolates the passages 36A and 38A from one another (which again is not the function of a restriction).

For the reasons give above, independent claim 1 is patentable over the Frick patent in view of the Cook patent.

Independent claim 11 is directed to a flow sensor package comprising a housing, an inlet, an outlet, first and second channels in communication with the inlet and the outlet, a sensing element, a restriction, and a seal. The sensing element is in the first channel, the sensing element has first and second opposing sides, the

Application Serial
No. 09/634,507

first side is in fluid communication with the inlet, and the second side is in fluid communication with the outlet. The restriction is in the second channel, and the restriction permits flow of a liquid through the inlet, the second channel, and the outlet. The seal engages the sensing element so as to prevent flow of the liquid past the sensing element, and the sensing element senses a pressure change across the restriction.

Applicant's Argument - As indicated above in connection with independent claim 1, the Examiner has misapplied the Frick patent to independent claim 11. The valve 88 as disclosed in the Frick patent is not a restriction that creates a differential pressure. The valve 88 either allows equal pressure between the passages 36A and 38A or isolates the passages 36A and 38A from one another. Neither of these functions is the function of a restriction.

Moreover, the Examiner recognizes that the sensor element 66 disclosed in the Frick patent is not in the first channel 36A (or in the second channel 38A). Moving the sensing element 66 to the first channel 36A (or the second channel 38A) will not meet the language of independent claim 11 because there is no differential pressure in the first channel 36A (or in the second

Application Serial
No. 09/634,507

channel 38A). The differential pressure exists only across these channels 36A and 38A.

Also, moving the sensor element 66 to the first channel 36A (or to the second channel 38A) would not meet the language of independent claim 11 because then, while the first side of the sensing element 66 would be in fluid communication with the inlet, the second side of the sensor element 66 would not be in fluid communication with the outlet. The isolation diaphragms 50 and 52 would prevent the second side of the sensor element 66 from being in fluid communication with the outlet.

Additionally, it would not have been obvious to move the sensor element 66 directly across the first channel 36A and the second channel 38A in order to make the sensor small and compact, as asserted by the Examiner. Such a modification is directly contrary to the teaching of the Frick patent, which instead discloses a need to isolate the sensor element 66 from the first and second channels 36A and 38A. Indeed, the Frick patent teaches away from such a modification of the pressure transmitter 10.

Therefore, because the Frick patent fails to teach a restriction in the first channel 36A (or in the second channel 38A), because moving the sensor element 66

Application Serial
No. 09/634,507

to the first channel 36A (or to the second channel 38A) would not meet the language of independent claim 11, and because the Frick patent teaches away from moving the sensor element 66 to a position where it is directly between the first and second channels 36A and 38A, independent claim 11 would not have been obvious over the Frick patent in view of the Cook patent.

Because independent claim 11 would not have been obvious over the Frick patent in view of the Cook patent, dependent claims 12, 15-17, and 19 likewise would not have been obvious over the Frick patent in view of the Cook patent.

Examiner's Response - See the Examiner's response in connection with independent claim 1.

Applicant's Rebuttal - See applicant's rebuttal in connection with independent claim 1.

Section 5 of the Office Action - In section 5 of the Office Action, the Examiner rejected claims 3, 4, 13, 14, and 22-24 under 35 U.S.C. §103 as being unpatentable over the Frick patent in view of the Cook patent and further in view of the Maurer patent.

The Maurer patent discloses a piezoresistive pressure transducer 10 that has a housing comprising first and second pieces 12 and 20. The first piece 12

Application Serial
No. 09/634,507

has a cavity 14 which extends part way through the first piece 12. A pressure port 17 of the first piece 12 communicates with the cavity 14. Leads 18a pass through the first piece 12 into the cavity 14. The second piece 20 has a pressure port 24. First and second elastomeric seals 30 and 32 are in the cavity 14. A square chip 34 is between the first and second elastomeric seals 30 and 32 and forms a central diaphragm 42. The chip 34 carries piezoresistive stress sensitive elements. The first elastomeric seal 30 is adapted to selectively conduct current from the piezoresistive stress sensitive elements on the chip 34 to the leads 18a. The two seals 30 and 32 and the chip 34 create a pressure tight seal across the central diaphragm 42.

With respect to independent claims 1, 11, and 20, the Maurer patent is redundant. Therefore, the Maurer patent does not supply any of the deficiencies of the Frick and Cook patents with respect to these claims.

Accordingly, independent claims 1, 11, and 20 would not have been obvious over the Frick patent in view of the Cook patent and further in view of the Maurer patent.

Application Serial
No. 09/634,507

Because independent claims 1, 11, and 20 would not have been obvious over the Frick patent in view of the Cook patent and further in view of the Maurer patent, dependent claims 2-4, 6, 7, 9, 12-19, and 21-24 likewise would not have been obvious over the Frick patent in view of the Cook patent and further in view of the Maurer patent.

Application Serial
No. 09/634,507

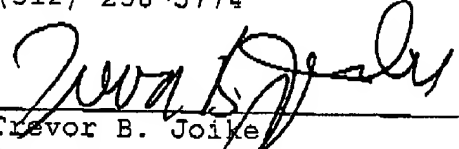
CONCLUSION

In view of the above, it is clear that the claims of the present application patentably distinguish over the art applied by the Examiner. Accordingly, allowance of these claims and issuance of the above captioned patent application are respectfully requested.

Respectfully submitted,

SCHIFF, HARDING, & WAITE
6600 Sears Tower
233 South Wacker Drive
Chicago, Illinois 60606-6402
(312) 258-5774

By:


Trevor B. Joike
Reg. No: 25,542

September 15, 2003